



NextGen Works for General Aviation

The general aviation industry plays an important role in the economy of the United States. It includes recreational flying, business jet operations, on-demand air charter and emergency medical service. General aviation operators have access to more than 5,000 airports throughout the country, compared to about 500 that the airlines use.

ADS-B

Automatic Dependent Surveillance–Broadcast (ADS-B) is one of the foundations of the Federal Aviation Administration’s Next Generation Air Transportation System (NextGen). It relies on avionics in the aircraft, a constellation of GPS satellites and a network of ground stations throughout the U.S. to transmit an aircraft’s position, ground speed and other data to air traffic controllers. Its coverage and accuracy is far greater than radar — updating the location of an aircraft every second — compared to radar, which has an average refresh rate of 12 seconds. The FAA has mandated that aircraft operating in most controlled U.S. airspace be equipped for ADS-B Out by January 1, 2020.

ADS-B In, which is not mandated, offers pilots additional options such as real-time, subscription-free graphical weather, a display of other aircraft in the area and other aeronautical information. This represents a significant safety enhancement for pilots, most notably improved situational awareness.

Much like the introduction of GPS about 20 years ago — at the time a new technology that was virtually unknown to aviation and somewhat expensive to install in aircraft — ADS-B will eventually serve as an indispensable tool for pilots. For general aviation pilots who are concerned about equipping their aircraft with yet another new technology, it is helpful to think of ADS-B as simply an updated digital transponder. Ninety percent of operators will be equipped with the 1090ES transponder required for ADS-B.

Enhanced safety is a key benefit of ADS-B. A 2014 Massachusetts Institute of Technology study found that among pilots who use ADS-B In on a regular basis, 42 percent of respondents indicated that it had helped them avoid a midair collision.

As of September 2016, more than 23,000 aircraft have been equipped with ADS-B Out avionics, a significant



ADS-B In offers enhanced safety and better situational awareness for general aviation pilots.

accomplishment led in part by Equip 2020 — a government-industry working group that helps operators equip with ADS-B. The Equip ADS-B website (www.faa.gov/nextgen/equipadsb) is an excellent source of information.

ADS-B has been integrated into automation platforms at all 24 en route air traffic control facilities — 20 En Route Automation Modernization systems and four Microprocessor En Route Automated Radar Tracking systems — and into all major Terminal Radar Approach Control (TRACON) facilities and more than a third of all terminal airspace facilities. The FAA plans to have ADS-B deployed at all TRACONs by 2019.

WAAS Mean Greater Airport Access

One major advance made possible by NextGen is the ability for an instrument-rated pilot to fly a satellite-based approach, or Area Navigation (RNAV) procedure, into an airport. An RNAV procedure is enabled by GPS and the Wide Area Augmentation System (WAAS), which enhances the accuracy of the GPS signal. It is used in the en route, terminal and intermediate legs of approach procedures.

RNAV and WAAS offer several significant advantages over a traditional ground-based Instrument Landing System (ILS) approach. Unlike an ILS, an RNAV procedure is not limited by mountainous terrain or a curved approach into the airport. With an RNAV approach, similar to an ILS approach, safety is enhanced regardless of visibility and whether the approach is being flown during the day or at night. At an airport where an ILS may be out of service, an RNAV approach serves as a key backup. Additionally, there are many U.S. airports — especially ones used by general aviation operators — that do not have an ILS or a VOR and are served only by an RNAV approach.

WAAS enables satellite-guided RNAV precision approach procedures with Localizer Performance with Vertical guidance (LPV) and Localizer Performance (LP) minimums, assuming that the aircraft is equipped with WAAS avionics. LPV minimums provide capabilities similar to ILS with horizontal and vertical guidance while LP provides only horizontal guidance.

Since nearly half of the RNAV approaches with LPV minimums are to airports that have no ILS, pilots are now able to access these destinations when visibility is limited, rather than rule them out.

The FAA also publishes approach procedures that use WAAS for horizontal but not vertical guidance. These approach procedures with LP minimums are needed at runways where obstacles or other infrastructure limitations prevent the FAA from publishing a vertically guided approach.

As of September 2016, there are 3,722 WAAS LPV approach procedures serving 1,812 airports. Of these airports, 1,058 do not have an ILS. There are also 621 LP approach procedures in the U.S. serving 462 airports.

New Fuel Technology

One primary benefit of NextGen is a significant reduction in aircraft engine emissions released into the environment. One challenge in making this benefit a reality is developing a replacement unleaded fuel for piston-powered general aviation aircraft, most of which currently run on 100 Low Lead fuel.

The FAA, working closely and collaboratively with the general aviation industry — aviation associations, aircraft and piston engine manufacturers, and fuel suppliers — has taken a leadership role in this effort.

It is likely that minor modifications to current piston engines will be required to accommodate the new fuel. The FAA's goal is to have an unleaded fuel alternative available to general



Satellite-guided approaches using the Wide Area Augmentation System (WAAS) enhance safety for general aviation pilots.

aviation operators by 2018. The agency is on track to meet this goal.

In 2013, the FAA and industry established the Piston Aviation Fuels Initiative (PAFI) steering group. This government-industry partnership is designed to facilitate collaboration on the development and deployment of a high-octane fuel that will have the least impact on the existing piston engine aircraft fleet and fuel-distribution system. The goal is to require very minor modifications to existing piston engines and to allow the new fuel to be manufactured and distributed through existing infrastructure.

Based on the steering group's work, six fuel producers proposed 17 fuel formulations for a two-phase PAFI test program. The FAA selected four unleaded fuels from three fuel producers — one from Shell, one from Total and two from Swift Fuels — for the first phase of testing, which was completed in 2015. The FAA then selected fuels determined to have the least impact on the general aviation fleet for Phase II: Shell and Swift Fuels. This testing started in March 2016 and will continue through 2018.

Phase II testing will develop data needed to clear the fuels for use in existing general aviation aircraft. It will be up to the marketplace to determine the one best fuel.

The FAA has met its new fuel technology goals and is halfway through an ambitious program that will benefit the general aviation industry and have a significant positive impact on the environment.